

REMARKS

Claims 12-26 are pending in the application. Claim 17 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention. Claims 12, 13, 14, 16 and 18 are amended herein. Claim 15 is cancelled. Claims 12-14, 16 and 18-26 remain for consideration.

Claim Rejections – 35 USC §112

The Examiner rejects claims 12-16 and 18-26. The Examiner states that:

... the specification, while being enabling for immersing the substrate in a first solution or dispersion of a first substance and a second solution or dispersion of a second substance, does not reasonably provide enablement for applying to the substrate a first solution or dispersion of a first substance and a second solution or dispersion of a second substance (claim 12). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. The instant specification only discloses immersing the substrate to apply the solutions or dispersions. A step of applying is broad enough to include methods other than immersion to apply the solutions or dispersions, e.g., spray coating, molding, spin coating, etc. Methods of applying other than immersion is not supported by the instant specification.

Claims 12 has been amended to replace all occurrences of “applying to” with --immersing --. Claim 15 is cancelled.

Claim Rejections – 35 USC §103(a)

The Examiner rejects claims 12-16 and 18-26 as being unpatentable over Zhang et al. (U.S. Patent No. 6,391,220) in view of the admitted prior art set forth on pg 2, ln 1-pg 3, ln 7.

In regard to claim 12, the Examiner states that:

Zhang et al teach the basic claimed process including a method for the assembly of a layer-by-layer thin film (col 4,ln 57-col 5, ln 6; figs 1-5); applying a release layer/substrate to a support surface/substrate (col 2, lns 40-45; col 4,ln 57-col 5, ln 6; figs 1-5)--as a note, it should be mentioned that the release layer and substrate of Zhang et al constitute the claimed substrate and support surface, respectively; forming a layer-by-layer thin film upon the release layer by any suitable process such as electroplating (col 4,ln 57-col 5, ln 6, figs 1-5), removing the release layer together with the thin film from the substrate (col 4,ln 57-col 5, ln 6; figs 1- 5); and separating the release layer form the thin film (col 4,ln 57-cal 5, ln 6; figs 1-5). Zhang et al also teach separating the release layer/substrate from the thin film without disturbing the integrity of the thin film (col 5, lns 46-55). However, Zhang et al does not teach forming each layer to have an average thickness of less than 100 nm; and forming the claimed thin film by the claimed substeps. The admitted prior art teaches it is well-known in the thin film technology to form thin films by the layer-by-layer (LBL) assembly method, wherein the each layer has an average thickness of 1-100 nm. The admitted prior art teaches that LBL comprising depositing a film on a substrate by repeating the process of: 1) immersion of the substrate in an aqueous solution of polyelectrolyte; 2) washing with neat solvent; 3) immersion in an aqueous solution of nanoparticles; and 4) final washing with neat solvent. This process can be repeated as many times as necessary depending on the number of layers required. Further, the admitted prior art teaches that LBL is an attractive alternative to other thin film deposition techniques because it is simple and universal. Zhang et al and the admitted prior art are combinable because they are analogous with respect to forming a thin film assembly.

The Examiner concludes:

Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the LBL method of the admitted prior art as the deposition process of Zhang et al in order to reduce process complexity. It should be mentioned that the separating methods of Zhang et al are the same as the instant invention thus the combined teachings of Zhang et al and the admitted prior art teaches the claimed limitation of overcoming the affinity between the first layer of the first substance and the substrate while retaining the affinity between the first substance and the second substance in the additional layers.

Applicant respectfully disagrees with the Examiner that Zhang et al.:

“teaches the claimed limitation of overcoming the affinity between the first layer of the first substance and the substrate while retaining the affinity between the first substance and the second substance in the additional layers.”

The Examiner has chosen to characterize Zhang et al. as “Zhang et al teach the basic claimed process including a method for the assembly of a layer-by-layer thin film (col 4, ln 57-col 5, ln 6; figs 1-5)”. The term “layer-by-layer” has specific meaning to one skilled in the art. That specific meaning, set forth in the specification at page 2, lines 11-19, requires layers of “oppositely charged polymers or polymers otherwise having an affinity”. The polymers may be, “water-soluble compounds” to form “stratified thin films in which layers of nanometer thickness are organized in a specific predetermined order”. The limitations of affinity, water-soluble, stratified, nanometer thickness, and order are all present in Applicant’s claim 12 and are not taught by Zhang et al., who does not use the term “layer-by-layer”. The very fact that when Zhang et al. refers to a “thin film” in

which the layers are 10-25 microns thick (total “between about 3 and about 100 microns”) while Kotov means something in which the layers are less than 100 nm thick indicates that these are different fields which define the meaning of “thin” differently by at least 2 orders of magnitude.

The Examiner has also quoted Applicant’s statement that “the layer-by-layer process [is] an attractive alternative to other thin film deposition techniques” from page 2, lines 13-15. However, in this same paragraph, the limitations of “oppositely charged polymers or polymers otherwise having affinity”, “water-soluble compounds”, and “stratified thin films in which layers of nanometer thickness are organized in a specific predetermined order” are also given. These limitations are not consistent with Zhang et al. and thus Zhang et al. and the admitted prior art are not analogous with respect to forming a thin film assembly.

Applicant refers now more particularly to the “affinity” limitation in claim 12. As noted by the Examiner, Applicant’s claim 12 requires “a first substance having an affinity for said substrate” and “said second substance having an affinity for said first substance” and the step of “overcoming the affinity between said first layer of said first substance and said substrate while retaining the affinity between said first substance and said second substance”.

Applicant asserts that it would not have been obvious to one having ordinary skill

in the art at the time the invention was made to use the LBL method of the admitted prior art as the deposition process of Zhang et al. as asserted by the Examiner. Zhang et al. teaches a very different method of fabricating flexible circuit structures. Zhang et al. relies upon a release layer 11 that is deposited on a substrate 10 (col. 2, ln 30-31). Zhang et al. relies upon “adhesive properties” of the release layer 11 (col. 2, ln 67; col. 3, ln 8; col. 3, ln 36) for the use of a “bonding material” or coupling agent (col. 3, ln 35-48). Such methods of coupling or adhesion are common. However, Applicant’s non-analogous method relies upon affinity between the various layers. Affinity is distinguishable from adhesion in Zhang et al. in that affinity requires, “an attractive force between substances or particles that causes them to enter and remain in *chemical combination*” (Merriam-Webster Collegiate Dictionary 10th edition © 1998) (emphasis added).

Applicant therefore asserts that the LBL technology of the admitted prior art and the instant application are not analogous to the method taught by Zhang et al. Applicant therefore requests reconsideration and allowance of amended claim 12.

In regard to claim 13, the Examiner states that:

... such is taught by Zhang et al (col 2, lns 40 col 4,ln 57-col 5, ln 6; figs 1-5)-- as a note, it should be mentioned that the release layer and substrate of Zhang et al constitute the claimed substrate and support surface, respectively.

In regard to claim 14, the Examiner states that "... such is taught by Zhang et al (col 2, lns 40-45; col 4,ln 57-col 5, ln 6; figs 1-5)."

In regard to claim 15, the Examiner states that "... such is taught by the above combined teachings of Zhang et al and the admitted prior art."

In regard to claims 16 and 18, the Examiner states that "... such is taught by Zhang et al (col 5, lns 46-55).

Dependant claims 13-14, 16 and 18 depend from amended independent claim 12 which is submitted to be patentable. Dependant claims 13-14, 16 and 18 are therefore submitted to be patentable for at least this reason.

Dependent claims 13 and 14 are additionally patentable because these claims have been amended to clarify that Applicant's thin film is a "composite polymeric member", which is not taught by Zhang et al.

In regard to claims 19-24, the Examiner states that:

... such is mere obvious matter of choice dependent on the desired final product and of little patentable consequence to the claimed process since it is not a manipulative feature or step of the claimed process. Further, it is well-known in the thin film art to build up layers of different material. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a third substance having an affinity similar to the first substance in the process of Zhang et al (modified) in order to produce diverse thin films.

Dependant claims 19-24 each add further limitations to claim elements of claim 12, which specifically require affinities between one substance and the substrate or another substance. Consequently, the claims describe limitations that are not mere

obvious matter as asserted by the Examiner. Instead, the claims describe particulars of a method involving layer-by-layer film technology that is not analogous to a method taught by Zhang et al.

In regard to claim 25, the Examiner states that:

... the claimed methods of cross-linking are well-known in the molding art. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use any one of the claimed methods to cross-link the layers of Zhang et al in order to effectively harden the layers of Zhang et al.

It would not have “been obvious to one of ordinary skill in the art ... to cross-link the layers of Zhang et al.”, because to one of ordinary skill in the art, it is known that the materials to be cross-linked must be compatible, ie. have suitable chemical groups that can react with each other. In Zhang et al.’s examples, there is an oxide substrate followed by a polymeric release layer followed by a metallic barrier layer followed by a conductive laminate formed by a combination of electroplating (most likely of a metal) and spin coating of a polymeric dielectric. The two polymers (release layer and dielectric) may be separated by a metallic barrier layer, preventing cross-linking. Even in embodiments in which the release layer and dielectric are in contact, cross-linking to increase the binding between the release layer and dielectric would be counter-productive since the purpose of Zhang et al.’s invention is to remove the conductive laminate (including the dielectric) from the release layer. Thus, there is nothing in Zhang et al. to suggest cross-linking and much to argue against it. It is only in the present invention in which multiple polymeric

layers may make up the desired thin film that cross-linking would provide an advantage.

In regard to claim 26, the Examiner states that "... such is taught by the above combined teachings of Zhang et al and the admitted prior art."

Dependant claims 25 and 26 each depend from amended independent claim 12. Dependant claims 25 and 26 are submitted to be patentable for at least this reason.

Considering the foregoing, it is sincerely believed that this case is in condition for allowance, which is respectfully requested.

This paper is intended to constitute a complete response to the outstanding Office Action. Please contact the undersigned if it appears that a portion of this response is missing or if there remain any additional matters to resolve. If the Examiner feels that processing of the application can be expedited in any respect by a personal conference, please consider this an invitation to contact the undersigned by phone.

Respectfully submitted,

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